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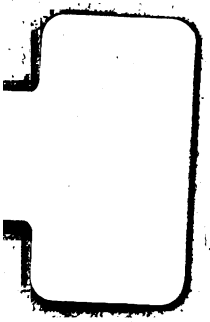
THE TEETH,

Their Formation,

DISEASES AND TREATMENT.

GADDES.



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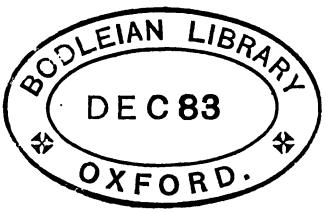

THE TEETH:

THEIR

Formation, Diseases & Treatment.

A

POPULAR AND SCIENTIFIC GUIDE FOR THE GENERAL PUBLIC.

BY

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THIRTY-TWO ILLUSTRATIONS.

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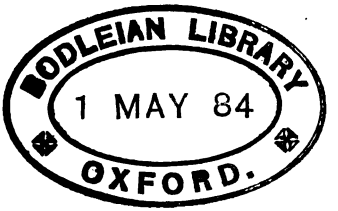
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PREFACE.

THIS little work has been written for the public. The subject matter has an almost universal application to civilised people. The subjects embraced by the thirteen chapters have been thought sufficient to awaken an interest in, and show the importance and the means, of preserving the Teeth. Each theme has been treated in a popular manner, at the same time with a scientific accuracy abreast of the present status of Dental Surgery. In this respect the Author believes he is supplying a wide felt want, and also that such a work has not hitherto been published in the United Kingdom.

46, SEYMOUR STREET,
PORTMAN SQUARE,
LONDON, W.

CONTENTS.

PAGE

INTRODUCTION... 1

PREVENTIVE TREATMENT—

The Development of the Teeth and Right Living 5

Right Living *(continued)* 13

Irregularity of the Teeth 21

Hygienic Treatment 27

CONSERVATIVE TREATMENT—

Decay of the Teeth and Treatment ... 37

Alveolar Abscess 55

Necrosis 59

Toothache 61

Neuralgia 65

TEETHING 72

ARTIFICIAL TEETH 76

GENERAL INSTRUCTIONS 79

THE LOSS OF THE TEETH.

INTRODUCTION.

THE loss of the teeth in the human subject is a fact of which nearly every civilised individual can furnish evidence. There are several diseases by which this loss is effected, and also many causes that tend to produce those diseases. By inquiring into the nature and causes, indeed, into all the circumstances of disease, has the knowledge of such been advanced; and the knowledge of diseases of the teeth has in that way very markedly increased during the past few years. Along with the acquiring of this greater amount of scientific information has there been, especially in the past two generations, a marked increase in Dental disease. Observation and statistics bear testimony to the statement that disease of the teeth is more prevalent now than in the days of our grandfathers. It therefore affords satisfaction to be able to announce that the educated portion of the Dental Pro-

fession has advanced to, and holds, a scientific status which compares favourably with any other branch of the parent science—Medicine; and that with the increase of disease there are better and more successful methods of treatment.

The treatment of diseases of the teeth may be classed as Preventive, Conservative, Palliative, and Radical. It is by additions to the former two principles of treatment that the progress of the Science and Art of Dental Surgery has lately been so marked; and, as a result of that, that mankind can now derive such enhanced benefits from the hands of the skilful Dental Surgeon. The adage, "Prevention is better than cure," has formed the text of the most able investigators; and Preventive State Medicine has now its representative Sanitary Medical Officer in every town of importance in the United Kingdom. Though the prevention of disease of the teeth has not yet been embodied among the details of State Medicine, still, certain of its principles are recognised. These principles of preventive treatment of disease of the teeth include hygiene and right living, and several

instances are recorded where this preventive treatment has been adopted, and most marked and satisfactory benefits have resulted; thus proving in practice the correctness and efficacy of principles theoretically established.

The most prevalent form of disease of the teeth is decay—technically known as Dental Caries—; and fully nine-tenths of the faulty teeth are affected with caries. The causes of this decay of the teeth are grouped as PREDISPOSING and EXCITING. Among the more common of the former, or causes that render the teeth susceptible to decay, are faulty structure and irregularity of position; and the chief Exciting cause, or direct factor of caries, is the presence of acid within the mouth and in contact with the teeth. It is a question whether this acid is the direct result of chemical action simply, or due to the destructive agency of fungi, or disease germs, the habitat of which has an acid reaction. The recognition of these facts gives the clue to Preventive treatment. That treatment, therefore, must be in the direction of right living during the formation of the teeth, and in the adoption of those hygienic measures by which

the cleanliness and healthy condition of the teeth and mouth are ensured and maintained.

In order to adopt a course of right living during the formation of the teeth, it is necessary to know the time at which such "restraint" should be enforced, and also to know in what consists that prime duty to self—right living. It is to not living rightly, to the very varied factors going along with and arising out of civilisation, that the broadest and most comprehensive generalisation of the cause of decay and loss of the teeth can be ascribed.

PREVENTIVE TREATMENT.

THE DEVELOPMENT OF THE TEETH, AND RIGHT LIVING.

The formation of the teeth begins at an exceedingly early age, the first sign of them being observable at seven and a half months before birth. It is from about the seventh week of embryonic life till the age of twenty years that the teeth are in course of formation. All the teeth are not being formed at one time, for while the first or milk teeth are chiefly occupying the field of development at the early age mentioned, it is, ordinarily, only the last molars or wisdom teeth that are completing the building up of their roots at the age of twenty years. At the seventeenth week of embryonic life the important stage of calcification, or hardening, of the temporary teeth commences; and at about the sixth month, or three months before birth, the same process begins in certain of the second, or permanent, set of teeth. At birth the calcification of the front teeth (incisors) of the second set takes place, and continues till the age of nine or ten years, or about two years

after they have taken their places in the mouth. The calcifying action of the temporary teeth, commencing at about five months before birth, continues till the age of four and a half years, at which period the formation of the first set of teeth is completed. At the same time that this important hardening process is going on in the temporary teeth, the similar operation in the permanent teeth arises, commencing at three months before birth and slowly proceeding in the several teeth until about the age of twenty years, when the last members of the series are completed.

The process of calcification is an exceedingly delicate one, and is properly effected only under the most favourable conditions. It essentially consists in the deposit of lime salts in a soft glue-like body, or basis-substance, having the form of the growing tooth. It would appear that the lime particles are deposited in this basis-substance according to ordinary chemical laws, while the living matter elaborates and determines the form and quantity of that basis-substance. The lime particles when first deposited are very minute, but

they increase in size, and in so doing the several little masses become fused or blended together. It is in this way the teeth become so very hard, and this hardness is most pronounced in the enamel. When the calcification of the tooth substance is perfect, the teeth are necessarily better able to withstand the causes of decay that come from without. But if there be a deficiency of lime, or should the conditions favourable to the chemical process be not quite right, there must ensue some imperfection in the structure that is being formed. With a faulty structure, which cannot in the course of nature be repaired, there exists that susceptibility to subsequent decay which was mentioned on page 3.

The lime and other calcifying salts are conveyed very close to the seat of these changes by the blood-vessels, and, furthermore, those salts are derived from the blood. For the present purpose it may be said that the blood obtains the several elements entering into its composition from the food taken, and if the food does not contain, either in sufficient quantity or at all, the essential elements that the blood is required to yield in

the building up of the teeth or other organs of the body, there necessarily arises some fault or imperfection. It will now be apparent that, in order to produce strong teeth, or a good physique, the proper quality and quantity of materials must be taken as food—for grapes do not grow on thistles. It will also now be understood that the particular period when this aspect of right living is to be observed is, so far as the teeth are concerned, from five months before birth till the age of twenty years. During the intra-uterine portion of this period it is the mother who must be the subject of proper diet; for if she does not take in her food the substances that her growing child requires, the structures of the child most assuredly suffer. How frequently are women *enceinte* known to take very little food, and that little mere trash; yet they dream of bringing forth fine children—children that may almost equal in weight the amount of food taken during that period! So, too, after birth, if the child be fed from the breast, the milk yielded cannot contain the necessary elements of nutrition if the individual so nursing does not take such

elements in her food. On the other hand, if the infant be brought up artificially, its milk, or other food, must possess the proper constituents. Likewise, during the early years of life, the diet of the child must be equal to the demands of its development.

There is another phase of right living in relation to development that must be noticed. Not only must proper food be taken, but improper things should be avoided. This latter requirement applies more especially to infants and young children. At that period of life the healthy balance of the rapidly-growing nervous system is easily disturbed. As an evidence of that there is the extreme frequency of convulsions and other diseases of the nervous system in early life—30·5 per cent. of the deaths under one year of age being from those diseases, and 24·3 per cent. of those under five years of age. The sympathies between the several organs are also more delicate at this tender age. Therefore, over-feeding, or an injudicious article of diet, or exposure to cold, or other unfavourable conditions, may readily disturb the equilibrium of healthy digestion, assimilation, nutri-

tion, growth, and development. It has already been mentioned that the process of calcification of the teeth is exceedingly delicate. This being so, any such untoward circumstances as those just enumerated are very liable to interrupt the perfect working of that chemical process; and where the action has been upset, the effects thereof are frequently seen indelibly imprinted as faults upon the teeth. According to the situation and nature of those defects, is the careful observer enabled to say that at a certain time the individual was the subject of some affection, as convulsions, bronchitis, measles, &c.

Before leaving the consideration of this aspect of the Preventive Treatment of Decay of the Teeth, it will be well, in order to make the article more complete, to allude to the hereditary character of Dental Caries. But mindful of the abstruse biological phenomena of heredity, and of the improbability of any practical hints being set forth in a short sketch such as this, a mere indication of the fact of hereditary disease of the teeth will be briefly given. It is an item of common observation that the teeth of an individual are

similar to those of one of his parents. That likeness may be as regards the position of the teeth, or of their shape, or colour; and, if examined more closely, there is frequently seen a similarity of the teeth of parent and offspring as regards structure, and seat and nature of disease. In such cases the local defects and consequent susceptibility to disease in the parent are handed down to the child, and in due course the child or youth presents a reproduction of the parent's infirmity, and that too generally, with a considerable plus on the side of disease. The Preventive Treatment of this form of disease—the correction of this hereditary tendency—must be applied to progenitors. For whatever of the causes of Dental degeneracy is due to heredity, those special tendencies have been imparted to the ultimate physiological units, or cells of function; and the cause of those tendencies has acted, not during embryonic life simply, but most probably before the act of generation. If this be true, and the evidence indicates that it is, the induction points to right living—preventive treatment—being exercised before the most grave responsibility of a parent be entered upon.

A practical summary of the foregoing paragraphs may be thus stated :—During the period of the development of the teeth the food must contain, in sufficient quantity, the earthy or lime salts that are necessary for their perfect calcification. This dietary should be observed by the mother while the child is a dependant upon her, and after that by the child itself, as an independent being. Also, that anything or any condition should be guarded against which may tend to derange the child's highly susceptible functional harmony of nutrition, growth, and development.

RIGHT LIVING—*continued.*

The preceding chapter not only supplies an answer to the question, When is it necessary to adopt a course of right living to promote the development of strong teeth? but it also leads up to the inquiry, What forms of food are best calculated to favour the formation of strong teeth?

During the first months of life an infant should derive its support entirely from milk. This should be the mother's milk; but a mother may be unable, or refuse, to suckle her child, or her milk may be poor and unsuitable for its support. Under such circumstances recourse must be had to some other means of supply, as a wet-nurse, or the milk of some other animal, which is usually that of the cow. To favour the secretion of good milk the woman must exercise care in what she eats and drinks. For while she may take a sufficient quantity of food, it must also be nutritious, and rich in earthy matters or lime salts. Food-stuffs suitable for a nursing woman include the flesh of animals (meat,

fish, &c.), eggs, milk, cocoa, tea (only once daily), a frequent use of whole-meal bread and oat-meal porridge, a small quantity of good stout, beer or wine. A diet of such materials as the foregoing, and the avoidance of things or conditions calculated to disturb healthy assimilation and secretion, will conduce to the formation of nutritious milk. In many instances the partaking of fruit, green vegetables, or anything of a sour nature, or of certain medicines, is liable to give to the milk griping, purging, or other injurious properties.

The alimentary canal of an infant is in a very immature condition of development, and most easily deranged, even by slight deviations in the character of the food; so that while, on the one hand, a nursing woman must be careful how she lives, it is, on the other hand, difficult to provide a good substitute for woman's milk.

The following analyses of human and of cow's milk, by Vernois and Requerel, show the relative proportion of the several constituents:—

	Woman.		Cow.
Specific gravity	1032·67	...	1033·38
Fluid	889·08	...	864·06
Sugar	43·64	...	38·03
Butter	26·66	...	36·12
Casein and extractive matter...	39·24	...	55·15
Incombustible (earthy) salts...	1·38	...	6·64
	1000·00		1000·00

It will be observed that the milk of the cow is richer in the amount of solid substances, with the exception of sugar, than is woman's milk. It is, therefore, necessary to dilute and add a little sugar to the cow's milk. But though, by this means, it is made to approach more closely the condition of human milk, there still remains an important difference in the nature of the casein or albuminous substance. When woman's milk is taken into the stomach of a child, the casein coagulates into small masses—forms little lumps of jelly-like substance—which are readily acted upon and digested; but the casein of cow's milk forms, under similar circumstances, much larger lumps that are more difficult of digestion, and in that way frequently give rise to serious trouble with the young infant. The formation of the casein into these large solid

lumps can be overcome by diluting the milk with barley water instead of with plain water; the addition of barley water causing the albumen to coagulate in small pieces, and, therefore, to be more digestible.

The degree of dilution of the milk varies according to the age of the infant, and also to the quality of the milk. So much does the milk from different cows differ in quality, that the amount of water to be added should be determined by a competent authority, as the medical attendant. With the average milk of the cow about equal parts, or one-third of sweetened barley water with two-thirds of cow's milk, may be used at first. In the course of some months the quantity of diluent may be slightly diminished. The amount of sugar added should be in the proportion of an ounce to three quarters of a pint of barley water. Where there is constipation, weak oatmeal tea may be substituted for the barley water. Where there is acidity, lime water may be added. In rare cases of inability to digest milk so diluted, it may be diluted with veal broth, or this may be given alone for a time. The milk of the ass or of the goat is

at times desirable, but not at all times obtainable. In all cases the food should be freshly prepared, and it is desirable that the milk be derived from the same pasture-fed animal. Also, with artificial feeding, especially during the warm weather, the perfect cleanliness of all bottles and utensils used must be ensured.

Sago, arrowroot, bread, biscuit powder, rusks, and numerous preparations, are unfit for the diet of infants, as they contain elements not found in milk, and which are injurious to the digestive organs during the weak and imperfect condition of infancy. Liebig asserts that the usual farinaceous foods are the cause of most of the diseases and of half of the deaths of infants.

For the first six months of their existence children should derive their sustenance entirely from milk; and during the second half of the first year, while other substances are gradually added to the diet, milk should form the chief part of their food. As age advances, and as the number of teeth and the digestive powers increase, meat and other solid substances may be given. Whole meal bread contains a much greater quantity of

nutritious substances than does the fine white bread. In fine white flour there is an exclusion of that portion of the wheat which is richest in nitrogenous and earthy matter; and as there is a large demand in the growing child for phosphate of lime, there is a great error committed in rejecting from the chief article of food (bread) those elements that are so necessary to the formation of strong bones and good teeth. The whole-meal or brown bread usually sold by bakers is improperly made with merely ordinary flour, to which has been added a dash of pollard or fine bran; the more valuable middlings, sharps, and fine pollard being excluded. Oatmeal porridge, also, forms an excellent article of diet for the young. Oatmeal contains a much larger proportion of nitrogenous, fatty, and mineral matters but, less starch than wheaten flour does. While the removal of the finer bran from wheat reduces the amount of nitrogenous and fatty contents of the flour, the removal of the husk from oats has precisely the opposite effect; so that the finer the oatmeal the richer it is in those ingredients. Whole-meal bread and oatmeal porridge are to some persons too

irritating and cause the food to pass along the bowels too quickly, so that there is not time for the whole of the nutriment of it to be absorbed and taken into the blood. In such cases those food stuffs may be only occasionally and sparingly partaken, whilst the use of other equally nutritious substances may be resorted to.

The following tables show the composition of fine flour, of whole meal, and of oatmeal:—

	Fine Flour.	Whole Meal.	Oatmeal.
Water	13·0	12·5	5·0
Nitrogenous Matter ...	10·5	12·2	16·1
Starch, etc.	74·3	69·5	63·0
Fatty Matter	0·8	1·5	10·1
Fibre	0·7	2·5	3·7
Mineral (earthy) Matter	0·7	1·8	2·1
	100·0	100·0	100·0

In connection with the above it will be instructive to show, in the following table, the composition of bone, of dentine, and of enamel:—

	Bone.	Dentine.	Enamel.
Organic Matter ...	33·30	28·01	3·59
Phosphate and Fluoride of Lime ...	53·04	66·72	89·82
Carbonate of Lime ...	11·30	3·36	4·37
Phosphate of Magnesium	1·16	1·08	1·34
Other Salts	1·20	0·83	0·88
	100·00	100·00	100·00

A short consideration of the foregoing tables will show that the bones and teeth, containing as they do such a large percentage of earthy matter, necessarily require, during the period of their growth, a liberal supply of those substances from the blood. And, it having been pointed out in the previous chapter that the blood derives those building materials from the food taken, there will likewise be apparent the nature and something of the significance of DIETETIC RIGHT LIVING during the formation of the teeth as an important principle of Preventive Treatment of their decay. The food-stuffs calculated to best promote the formation of strong teeth have also been mentioned.

IRREGULARITY OF THE TEETH.

Irregularity in the position of the teeth is very frequently observed, and it is one of the Predisposing causes of decay. By neighbouring teeth overlapping one another, or being placed in such relation to each other that they cannot be cleaned on all their surfaces, are they very susceptible to decay. In consequence of irregularity in the position of teeth do food, secretions of the mouth, and other substances, remain in contact with them. These things not being removed by the tongue, lips, tooth brush, or other means, readily decompose and form acids which act upon and destroy the teeth, thus becoming a direct or Exciting cause of decay. In this instance the Exciting cause of decay has the irregularity in the position of the teeth as a condition necessary to its existence; therefore irregularity predisposes to decay.

Irregularity in the position of the teeth is also in many instances a source of considerable personal disfigurement, and impediment to speech and mastication. For these several

reasons deformities of that nature should, as far as possible, be prevented, and where they exist early treatment should be resorted to.

There are many causes that lead to the permanent or second teeth taking irregular positions. The chief of these are the prolonged retention of the temporary or milk teeth, the premature removal of those teeth, and a disproportion between the size of the teeth and that of the jaw. Of the first named cause examples are frequently seen. Here the second teeth come through the gum behind, or by the side of, the milk teeth; and by these latter being allowed to remain under such conditions, the new permanent teeth are directed into wrong and irregular positions. In cases of this kind the first or milk tooth, which is forcing the second tooth into a wrong place, should be removed. In the majority of instances nature effects a gradual loosening and the loss of the temporary teeth before the permanent successors appear in the mouth; but she very often requires the assistance or interference just mentioned, and if it be not obtained, deformity and its consequent disastrous tendency result.

The anxiety to assist nature has to be tempered with judgment, for the premature, or too early removal of the temporary teeth—whether with the view to give room for the permament ones, or for the relief of pain—in certain cases favours and actually leads to irregularity in the position of the second teeth. Therefore, while by the extraction of a milk tooth a slight misplacement of a second tooth may be at once remedied, yet, by that very act, subsequent and more serious deformity is almost certain to follow. More particularly does this apply to the too early removal of certain teeth, for some of the milk teeth may be extracted at any time with comparative impunity. It is in this latter respect that knowledge and judgment are required to be exercised, for while immediate improvement may be effected, the after and consequent results may be serious deformity. In the *Monthly Review of Dental Surgery*, Vol. IV., page 297, the Author published a Clinical Lecture, titled "The Premature Extraction of the Temporary Teeth." This lecture was delivered to the Students of the National Dental Hospital in 1875, and the

technical and practical aspects of the question were conclusively demonstrated and explained by means of living examples and models.

Small jaws and large teeth are conditions which directly lead to irregularity in the position of the permanent teeth. This disproportion between the size of the teeth and of the jaws is very frequently seen, and especially among communities where the luxuries or resources of civilisation are dominant. Such a condition is exceedingly rare among primitive races. The cause is probably to be found in the ever recurring examples of the factors of retrograde and progressive development acting more quickly upon the highly organised bone of the jaws than they do upon the size of the less organised organs—the teeth. Heredity, also, is a not uncommon proximate cause, and a particular deformity is occasionally handed down from parent to offspring. Cases of this nature should be seen as soon as the first of the permanent teeth make their appearance, so that by close observation, from time to time, the Dental practitioner may become thoroughly acquainted with the special fea-

tures as they arise, and the necessary treatment minimised.

With regard to the Prevention and the Treatment of Irregularity of the Permanent Teeth the following generalised instructions are given :—

It is of the greatest importance that children from four years of age and upwards should have their teeth frequently examined by a Dental Surgeon, to see that the first set, particularly the back teeth, are not decaying too early; and to have the opportunity of timely treatment for the regulation and preservation of the second set.

The treatment of Irregularity in the Position of the Teeth by mechanical means is in many instances comparatively simple; but numerous cases occur in practice where the ingenuity of the practitioner is put to a severe test. What can be accomplished in that way often appears quite wonderful to the uninitiated, while the improvement in the facial expression, speech, and power of mastication, is not less satisfactory than is the consequent decreased liability to decay.

The proper arrangement and articulation of the teeth are shown in the accompanying

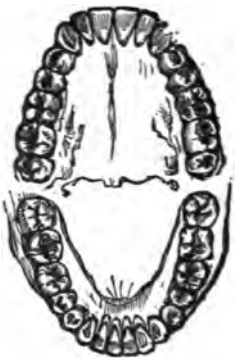


FIG. 1.

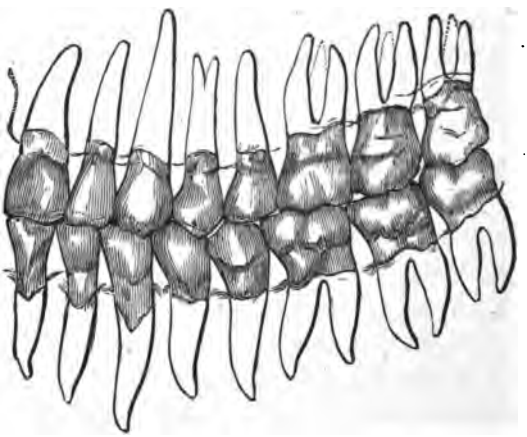


FIG. 2.

woodcuts; Fig. 2 representing the teeth of the left side of the upper and of the lower jaw.

HYGIENIC TREATMENT.

In the Preventive Treatment of decay and loss of the teeth, the cleanliness of the mouth is a pre-eminent item. To maintain a clean and healthy condition of the teeth and their surrounding structures necessitates the use of some cleansing means. Without any attention of this kind, food, and the secretions of the mouth, including tartar and other substances, adhere to and accumulate upon the teeth. Not only does this deposit lead to decay of the teeth, as mentioned in the previous section (page 21), but, as it collects in greatest abundance at the necks of the teeth, the gum is irritated and becomes inflamed. The deposit now increases in amount, especially at the expense of the surrounding gum, causing the inflamed gum and bony sockets of the teeth to recede. Consequently the teeth, being gradually deprived of their support and means of attachment, loosen and eventually fall out. Teeth lost from this cause are frequently quite free from decay, but sometimes the two conditions co-exist. Apart from this

destruction of the gum and loss of teeth, the appearance of the teeth while in the mouth is anything but pleasant, and the breath is offensive. Also the fœtor of the breath arising from these and other similar causes is unhealthy to the individual, whose inspired air, that goes to purify the blood, is likewise charged with the fœtid elements. The personal comfort of a pure breath and clean teeth, of a knowledge that in these respects one is not repulsive to others, is alone worthy of hygienic attention being paid to the mouth. But when a knowledge of the unhealthiness and the destructive tendency of insufficient or no attention to cleansing the teeth is added to the discomfort arising from such neglect, the significance of the hygiene of the mouth is not to be despised.

The tartar, or salivary calculus, which usually forms a large proportion of this deposit upon the teeth, consists chiefly of lime elements. These earthy substances are secreted along with the saliva in the salivary glands, and are held in solution or suspension in the water of the mouth. Under certain circumstances these lime salts are thrown

down, and their deposition takes place more quickly upon a rough unclean surface than upon one that is smooth and clean. Therefore, when the teeth are not kept clean, and where a small quantity of this tartar has already formed upon them, it accumulates much more rapidly than under the converse conditions. Tartar, when it has accumulated beyond a very small amount, is essentially an evidence of neglect, for the diligent use of the tooth brush will, in most cases, more or less prevent this disagreeable and destructive deposit. In cases where this formation cannot be or is not prevented periodical visits to a careful Dentist are necessary, in order to have it removed, and the deleterious consequences of its presence averted. The situations where

FIG. 3.

FIG. 4.

this deposit is found in greatest abundance are behind the lower front teeth, and on the

cheek surface of the upper grinding (molar) teeth.

Figure 3 represents a lower front tooth attached to which is a large mass of tartar; by its accumulation the gum and socket of the tooth were gradually absorbed, and the tooth eventually fell out.

Figure 4 represents the exact dimensions of a similar accumulation upon two upper molar teeth.

The substance which gathers upon the teeth through want of proper attention also contains a large quantity of a parasitic growth called *leptothryx buccalis.* This is a microscopic fungus, and is also found in the holes or cavities produced by decay of the teeth.

FIG. 5.

The accompanying figure illustrates this organism.

It consists of long slender threads which become densely felted together in white masses, and there are usually mixed with it *micrococci* (see fig. 6) and other parasitic fungi.

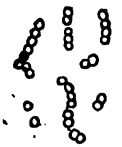


FIG. 6.

Figure 6 represents some of the microscopic fungus called *micrococcus.*

A deposit or stain of greenish brown colour is frequently seen upon the upper front teeth of children. When this has once formed it is difficult to remove, and its destructive action upon the enamel is very rapid. Furrows and

FIG. 7.

pits, as represented in figure 7, soon appear, and the decay quickly goes on until the con-

dition shown in figure 8 has been produced. Frequently the front teeth of young people are in this way destroyed, and the want of proper

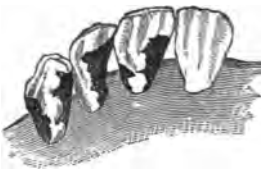


FIG. 8.

attention to the teeth is the forerunner and proximate cause.

Of the several ordinary means that can be adopted for cleaning the teeth, the use of a tooth brush is the most important. This article of toilet should be small in size, moderately soft, the bristles not too closely set, and they should be of different lengths. The use of a brush that is too hard, or even the too vigorous application of a soft brush, is more likely to do harm than good. The injury that is liable to follow immoderate scouring is recession of the gum, and when this misdirected energy is applied crosswise it also scrubs away the tooth substance at the edge of the gum, possibly producing the con-

ditions represented in figures 9, 10, and 11.

FIG. 9.

FIG. 10.

FIG. 11.

The teeth should be brushed up and down as well as across from side to side on the inner, the outer, and the masticating surfaces. By the first named movement the longest bristles are made to pass between the teeth and cleanse the contiguous surfaces of neighbouring teeth, and also to remove any substances that may have accumulated betwixt them. The efficient cleansing of these interspaces is most important and requires great care, otherwise the deleterious action of the retained substances continues undisturbed. The brushing should not be limited to the teeth, but the gums should likewise be subjected to gentle friction. There is rarely any objection to the friction causing the gums to bleed slightly, as the circulation in the parts is thereby improved and congestion relieved or prevented.

For maintaining a healthy and clean condi-

tion of the teeth and mouth, next in value to the use of a tooth brush is the application of a dentrifrice. Some judgment is required in selecting a suitable dentrifice, and a little strength of mind is necessary to avoid the numerous nostrums and preparations of that nature which are so temptingly placed before the public. As a generalisation it may be said that, for ordinary purposes, any preparation containing a gritty substance, such as charcoal, or a bleaching agent to whiten the teeth, is injurious and should be avoided. As a cleansing agent soap is most valuable. A little of the ordinary toilet or castile soap may be taken upon the tooth brush, or a saponaceous dentrifrice may be used. In addition to the soap some precipitated chalk or other non-gritty material is useful.

Therefore a tooth brush, soap, and some substance similar to precipitated chalk form the essential ingredients of a dentifrice for ordinary use in ordinary cases. But special cases require special consideration, and the use of an astringent, an antacid, an antiseptic, or other specific preparation is not unfrequently necessary to restore or maintain a

healthy condition of the mouth. In cleaning the teeth, and particularly after using a tooth powder, the mouth should be well rinsed with tepid water, working the cheeks and tongue to force the fluid between the teeth and thus remove any loose particles or retained powder. In many instances a gargle or mouth wash, having medicinal properties, is indicated, and in the suitable selection of such agents judgment is required. The daily use of floss silk, passing it between the teeth to dislodge foreign particles, and also the removal of food by means of a quill tooth pick, are valuable hygienic and preventive measures.

The teeth should be cleaned at least once a day, and the best time is at night—last thing. What there is to be removed had much better be got rid of at this time, and not be allowed to remain to undergo chemical change and aid the work of destruction during sleep—the usual length of time being eight hours. This daily cleansing should be thoroughly done; and to rinse the mouth, or even the gentle use of the tooth brush, after taking food, is a beneficial hygienic action. If the habit be cultivated to devote the necessary attention

to the teeth, this duty to self is not irksome, but simply forms part of the ordinary toilet; and, therefore, children should be taught to rinse the mouth night and morning, and to begin the use of the tooth brush early.

When acid medicines, food or drink are taken, the teeth are "set on edge," and the acid has a destructive action upon the teeth. To prevent this deleterious influence, acid medicines may be taken through a tube, and the mouth may also be rinsed with an alkaline gargle.

CONSERVATIVE TREATMENT.

DECAY OF THE TEETH AND TREATMENT.

It was stated on page 3 that the most prevalent form of disease of the teeth is decay or dental caries, and that the causes are grouped as PREDISPOSING and EXCITING. Also, that among the more common of the causes that render the teeth susceptible to decay are irregularity of position and faulty structure. The former predisposing cause has already been dealt with (see page 21); and now some of the forms or aspects of faulty structure will be considered. In the first place, it may not be

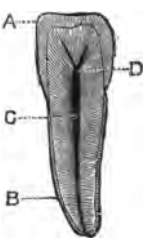


FIG. 12.

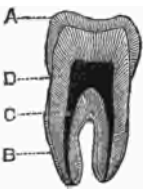


FIG. 13.

Fig. 12 and 13 represent a section of an upper incisor and a molar tooth respectively. The several tooth substances are shown—at A the enamel, B cement covering the root, D dentine forming the bulk of the tooth C the pulp or so-called nerve.

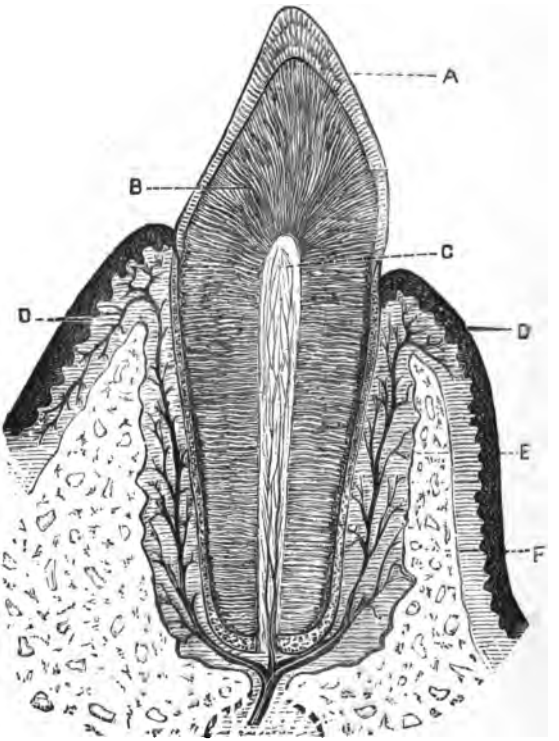


FIG. 14.

Fig. 14 diagramatically illustrates a section of a canine tooth implanted in its bony socket. A enamel, B dentine, C pulp, D gum, E periosteum, connecting the cementum of the tooth with (F) the bone of the jaw. The blood vessels and nerves are seen branching in the pulp, periosteum, and gum, while those of the bone are not shown.

uninstructive or without interest if attention be directed to the structure of a normal tooth and its relations to the surrounding tissues. These are shown in figs. 12 and 13, and are diagramatically represented by fig. 14.

The principal kinds of faulty structure here alluded to are those apparent malformations of tooth substance that are visible to the unaided eye, and which are characterised by a pitted and deeply furrowed surface (see figs. 15, 16, 17); also those teeth in which there are deep fissures (see figs. 19 and 20); and, lastly, those teeth which in the young are to outward appearance good, white, and frequently regarded as pretty, but which in reality are imperfectly calcified, soft, and rapidly decay.

FIG. 15.

FIG. 16.

FIG. 17.

Each of the above figures represents a tooth with a very irregular and pitted surface. The pits are due to a loss or absence of enamel,

and the enamel that does exist is very soft, of imperfect structure, and readily destroyed. The condition is caused by an interruption in the process of development, and this is regarded as generally resulting from an inflammation of the surroundings of the forming tooth. The administration of mercury to young infants is so frequently associated with the after appearance of teeth of this character that the term "mercurial teeth" has been applied to them. While mercury is a valuable drug, it is too frequently given unnecessarily to infants and young children; and one of the popular forms in which it is given is as "teething powders." If this drug does produce such impaired and destructive action upon the developing teeth—and that it does, is the opinion of many able men—its administration to an infant without proper medical advice, and particularly in the insiduous nostrums so largely advertised, is more serious than ordinarily appears. And with regard to the teeth, it is not until some six or eight years after its administration that the permanent teeth, on appearing in the mouth, visibly show its injurious effects.

Though the inflammatory condition which produces this kind of faulty development may be caused by the exhibition of mercury, it may also depend upon other things, as aphtha, inflammation of the mouth, rickets, &c. It was pointed out on page 6 that the process of tooth calcification is an exceedingly delicate one, and is properly effected only under the most favourable conditions; and now will be apprehended something of the effects of the causes just mentioned, which derange the child's highly susceptible functional harmony of nutrition, growth, and development.

In pitted teeth such as those now under consideration, having an enamel covering imperfect as regards smoothness of surface, deficient in amount, and soft and faulty in structure, decay is very liable to arise, frequently at several points, and progress quickly. This enamel is soon eaten away, and the dentine is thus exposed to the destructive agency. Like the enamel, the dentine, which forms the bulk of the tooth, is also in these cases faulty in structure; and when decay attacks it the disease rapidly proceeds, and the crown of the tooth becomes a carious mass, broken

down, painful, offensive, and of little use. The faulty nature of the dentine of a pitted tooth is illustrated by fig. 18.

FIG. 18.

Fig. 18 is a section of the tooth shown by fig. 16. The irregular enamel is represented at A, while B illustrates the areas of imperfectly formed dentine.

Another kind of faulty tooth structure which predisposes to decay is the existence of deep fissures in the enamel. The grinding teeth most frequently present examples of this form of susceptibility to decay, while to the casual observer they appear good and strong. The condition is represented in figs. 19 and 20.

These imperfections are developmental, and they are often met with in the teeth of persons of strong physique and good health; while,

on the other hand, the weakly and delicate present numerous examples of this variety of faulty structure. These fissures and crevices permit the lodgment of food, and this is retained, owing to the impossibility of removing it by ordinary means. The imprisoned food undergoes fermentation and decomposition,

FIG. 19.

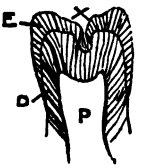


FIG. 20.

Fig. 19 illustrates the masticating surface of a molar with several fissures, which are shown by the dark lines. Fig. 20 represents a section through one of the fissures shown in fig. 19. At X the fissure is seen, and at the bottom of it the enamel (E) is very thin.

and the products of these changes act directly upon the enamel. Where the enamel is strong and otherwise well formed, the decay goes on very slowly, and may not be manifest until the tooth has been in use for many years; but where the enamel is otherwise defective, the decay becomes apparent in a short time after the tooth has appeared in the

mouth. Under any circumstances, the enamel at the bottom of the pit is very thin, and offers a very moderate protection to the dentine beneath. This will be seen on reference to fig. 20. The seat of decay is shown in fig. 21, and the more advanced state in fig. 22. In each case the decay has affected the dentine more than the enamel, thus giving little or no external indication of the presence of the

FIG. 21.

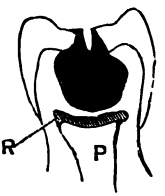


FIG. 22.

Fig. 21 shows the seat of decay at the bottom of the fissure, there being scarcely any indication of it externally.

In fig. 22 the disease has advanced affecting the dentine chiefly, and the outward appearance does not indicate the considerable extension and depth of the decay. At R the pulp (P) has elaborated a protective layer to shield it from the invading disease.

disease. In fig. 22 the caries has advanced to near the pulp, but this very sensitive structure has been stimulated thereby, and a protective covering of hard dentine (R) has been formed

to shield it from the irritating foe. The progress of the disease is usually more rapid than the formation of this shielding substance, and eventually the pulp or nerve becomes the seat of inflammation, and gives rise to acute pain.

Faulty development commonly assumes another form, and those teeth which in the young are to outward appearance good, white, and frequently regarded as pretty, are in reality too often imperfectly calcified, soft, and quickly decay. In such teeth there is a deficiency in the amount of earthy matter, and consequently their hardness and resisting qualities are impaired. The enamel and dentine are faulty, and though this is only to be seen by the aid of the microscope, yet the general appearance of the teeth enables the astute observer to predict their susceptibility or predisposition to decay. To observe the principles of Right Living during the formation of the teeth, as pointed out on page 13, is the direction in which prevention of this condition of the teeth is to be found.

The position in which decay is mostly found in this class of teeth is at the sides, where they come in contact with one another. Where the

teeth are very close together, the mutual pressure injures the not very hard enamel; also food and other substances are liable to be retained in such situations and, by decomposing, act directly upon a weakened enamel, and thus decay becomes established. There are not infrequently seen cases of this kind where, before the age of sixteen, the majority of the front upper, and several of the back teeth are affected with decay in various stages of progress. It is where there is this form of susceptibility to decay that particular attention should be paid to cleaning the teeth, and to the use of floss silk, as mentioned on page 35.

The foregoing examples of faulty structure will now be readily understood as Predisposing to decay of the teeth. Though there are several other forms of abnormal development, those here dealt with are sufficient to show how such conditions favour the decay of the teeth.

The chief Exciting cause, or direct factor of dental caries, is generally regarded as the presence of an acid within the mouth and in contact with the teeth. It may be mentioned by the way that an universally acceptable theory

of dental caries has not yet been formulated, but, notwithstanding the various theories of physical, chemical, electrical, vital, parasitic, and developmental causation, the balance of opinion is in favour of the causes being developmental or Predisposing, and chemical or Exciting. The chemical action is dependent upon the presence of an acid, and this is derived from the fermentation and decomposition

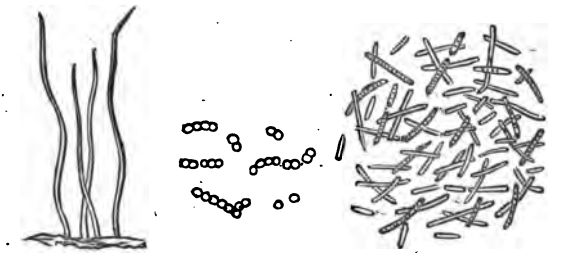


FIG. 23. FIG. 24. FIG. 25.

Fig. 23, Leptothryx; 24, Micrococcus; 25, Bacillus,—microscopic fungi or germs found in connection with the decaying tooth substance.

of food and other substances retained in contact with the teeth. When decay has become established fungi or disease germs are to be found, and probably they augment the destructive process. Some of the germs found in connection with decay of the teeth are illustrated in figs. 23, 24, and 25.

It occasionally but very seldom happens that the process of decay becomes arrested, the disease generally progressing and leading to the complete destruction of the tooth. The progress of the disease may be slow, as in strong well formed teeth; or it may be very rapid, as in the soft imperfect teeth. In the former case the decayed material is dark coloured and the tooth substance hard; whereas in the latter it is light coloured, and the tooth substance soft and easily cut.

The Conservative Treatment of caries of the teeth consists in the removal of the decayed portion and inserting a filling material into the hole thus made so as to exclude all food, fluid, and other substances, that may excite the recurrence of the disease. The smaller the area of decay that is treated in this way the greater are the prospects of success. In some instances, when the disease is seen in its early stage—only a superficial portion of the enamel being affected—the decay may be filed out, and the surface polished, and, afterwards keeping the part clean, this treatment is very often successful. The treat-

ment of decay in those pits and fissures illustrated in figs. 19, 20, and 21, is, of course, best effected when the disease is in an incipient state, for then only a small amount of tooth substance has to be sacrificed; whereas if the disease is allowed to go on until it has assumed the condition shown in fig. 22, a large amount of overhanging enamel has to be cut away to make the cavity of the best shape in which to insert, and also to hold, the filling material. So certain is decay to commence and progress in these fissures, that it is good practice for a Dentist to recommend their being filled, even though no decay be present; for by thus anticipating disease, which in such situations progresses very insidiously, there is required the least possible sacrifice of tooth substance, and a small filling is eminently better than a large one. It is the stopping in a small hole that is of the greatest service, though not unfrequently a large filling preserves the tooth for years.

To derive the greatest benefits from the Conservative Treatment of the teeth necessitates periodical visits to a careful Dentist, that he may, by close examination, ascertain if there be any disease, or where decay may be

expected to begin. Some teeth are so poorly constituted and the exciting causes of caries are so very active, that a visit to the Dentist is required to be made every three months. The conditions in other individuals make it advisable that they should pay such visits once in six months; while very few people can allow a longer period than a year to pass without some treatment being required. The desirability of early treatment of decay cannot be too much emphasised, while the advantages —the less time required, no complication, less sacrifice of tooth substance, no painful pulp to deal with, the greater average success of small fillings, &c.,—fully compensate for periodical examination of the teeth.

When the disease has advanced beyond the incipient stage to the state shown in fig. 21, where the dentine is reached, it progresses much more rapidly. This is due partly to the softer condition of the dentine, and chiefly to the greater area of decaying surface keeping the destructive agents in constant contact with the tooth substance. In this way, the greater the area of decay the more rapid is the process of disintegration and breaking down. The

caries goes on advancing nearer and nearer to the pulp, until that sensitive structure becomes exposed to the irritating influence of the decaying and putrid surroundings. What remains of the crown of the tooth then disappears piece by piece until nothing but the roots are left, and these slowly disintegrate and continually give off a disagreeable, offensive, and unhealthy discharge. As the pulp, or so-called nerve, is approached, there is generally some pain experienced; but when that structure becomes exposed by the decay of the dentine covering it there is rarely any exception to attacks of acute pain. The pulp

FIG. 26.

Fig. 26 shows the condition of a very carious tooth, to the left hand root of which an abscess is attached.

shortly afterwards suppurates, and the pus frequently accumulates at the end of the root or roots forming an alveolar abscess. (See fig. 26.)

This is accompanied with swelling of the gum and face, considerable pain, constitutional disturbance, and other symptoms.

The nearer the pulp is approached by the decay the more is it affected and its healthy condition impaired; and before filling teeth in which decay has advanced so far as to implicate the pulp, some preparatory treatment is almost invariably necessary. In cases where the pulp has been exposed by decay and is the seat of inflammation, it may, by careful and delicate treatment, frequently be restored to a healthy state and the tooth filled, thereby preserving it as a useful and comfortable member for years. Even where abscess has formed the tooth may be saved. Here the necessary treatment to get rid of the accumulated pus, to overcome the diseased action, and regain a healthy state of the tooth and its surroundings, requires time, great care on the part of the Dentist, and the patient to have fairly good health. Two or more visits are generally necessary for the application of remedies, while nature must have time and favourable conditions for the reparation of the tissues and functional harmony which were destroyed by the suppurative

action. When this has been accomplished, or is in a fair way of being effected, the tooth may be filled. There are innumerable examples of teeth having been the seat of abscess and treated according to the light of modern science, having done good service for many years.

There are numerous filling materials, many of which possess excellent preservative qualities. Beyond the general statement that no one filling material is suitable for every case, the use of any particular substance will not here be discussed. But before dismissing this question it may be justly stated that gold is very largely employed as a filling material, and with it extensive restorations of tooth contour can be made. Its use for this purpose involves on the part of the operator considerable expenditure of energy, great skill, and the highest degree of manipulative ability.

The preservative benefits of treating decay by filling are unquestionable; but occasionally cases are met with where the best efforts of conscientious and good operators are unsatisfactory and disappointing. Where the tooth substance is soft and ill-formed, and the secretions and conditions of the mouth quickly

induce caries, fillings have only a poor chance of permanently saving the teeth. Excellent operations often fail through want of cleanliness and care on the part of the patient. A tooth that has been filled requires more careful cleaning than one that has not been the seat of disease; therefore the work of the Dentist should be seconded by hygienic attention on the part of the patient.

ALVEOLAR ABSCESS.

Alveolar abscess, or gumboil, is a suppuration of the periosteum or membrane lining the bony socket or alveolus in which the root of a tooth is fixed. The matter usually gathers at the end of the root, and is inclosed in a little bag. (See figs. 26 and 27.) As

FIG. 27.

Fig. 27 represents an upper molar on the right hand (palatine) root of which an abscess exists.

the pus accumulates at this part and this sack gets larger, the bone of the jaw is eaten away or absorbed to afford it accomodation. The pain produced at this stage of the disease is very great, and the tooth is raised in its socket, and is exceedingly tender. The gum begins to swell, and then the face becomes affected. The swelling of the face

often gives rise to considerable deformity, to the closing or the blackening of an eye, and to great difficulty in opening the mouth and taking food. There is also a variable amount of feverishness and general disturbance. The pus finds its way to the surface of the gum and, the abscess bursting, is discharged into the mouth. But this more favourable result does not always occur. The matter may burrow deeply and the abscess open upon the face or in the neck, producing, it may be, a slight scar or considerable permanent deformity. Cases are recorded of abscess in connection with the teeth passing to the brain and causing death. When an alveolar abscess exists there is always uncertainty as to the course it may take or the damage it may do. An acute abscess may form and run its course, opening into the mouth or upon the face, in twenty-four hours; or the inflammatory and suppurative processes may extend over three or four days, or even weeks, producing considerable suffering and constitutional disturbance. When an abscess opens and discharges some relief is generally experienced. Though the swelling may now go

down and the discharge apparently disappear, the abscess is not healed, but it nearly always remains in a chronic state as a little bag at the end of the root, emitting matter from a small opening. Under certain conditions, and without warning, a chronic abscess may assume an acute form—pain, swelling of the face, deformity, and all the attending uncertainties are again encountered.

The cause of Alveolar Abscess is, in ninety-nine cases in a hundred, decay leading to exposure and consequent inflammation of the pulp or so-called nerve of a tooth. This process has already been described at page 51, and in the following pages sufficient has been said of the treatment of this common disease. But to emphasise what has been stated, and to urge attention to be given to the disease under consideration, the following advice is offered :—

When a tooth shows signs of becoming, or has become the seat of abscess, either through neglect or otherwise, at once consult a reputable Dentist. If the tooth can be saved, that of course is desirable. There are innumerable examples of teeth having been the

seat of abscess and treated according to the light of modern science, having done good service for many years. If the tooth or root cannot be restored to a healthy condition, by all means have it removed immediately.

There is an idea, which is very general, that teeth or roots should not be extracted while the face or gum is swollen, but this is a popular fallacy. The teeth or roots being the cause of the abscess should, if they are past redemption, be removed at once. The philosophy of taking away a cause to remove an effect requires no argument.

When an aveolar abscess or gumboil is forming and a Dentist cannot be consulted, do not apply a poultice or fomentation to the outside of the cheek, or the face, or neck. Such practice will favour the abscess bursting externally and thus producing a scar. But rather use hot fomentation within the mouth, and take an aperient.

NECROSIS

The jaw bones are liable to disease, and occasionally instances occur in which a portion of the bone dies — this constituting NECROSIS. The part of the jaw in which are the sockets or *alveoli* for the teeth, is called the alveolar portion; and when abscess forms in connection with the teeth it is located in this portion of the bone, which is also affected by the destructive process. Hence the term Alveolar Abscess—the disease described in the preceding chapter. Necrosis of a portion of the jaw in which the teeth are implanted often arises from an alveolar abscess; but it may also be due to violence or to some constitutional affection. Death of a piece of bone may occur at any age. Children, and especially the delicate, are more liable to this disease. Measles, scarlatina, and the eruptive fevers, are not unfrequently followed by necrosis of a portion of the jaws, and in these cases the developing permanent teeth come away and are lost with the dead bone. Whether the bone dies as a result of an

alveolar abscess, or as an after effect of one of the fevers, the disease is slow in its progress, and the discharge of pus continues until the dead bone is thrown off. This may extend over a month, or even two or three months, and produce considerable derangement of health.

The object in mentioning this subject here is to point out that serious consequences may arise from neglect and decay of the teeth; and that death of a portion of either jaw, with its attendant evils, is one of several diseases of a painful, chronic, and dangerous character that have for their exciting cause disease of the teeth.

To avoid verbosity, and to abstain from including in the pages of this treatise matter that would tend to weary the general reader, mention will be made of only two other afflictions which often arise from disease of the teeth—namely, Toothache and Neuralgia.

TOOTHACHE.

Toothache is the commonest of all the pains the civilised human family endures. The immortal Burns designates it :—

"Thou hell o' a diseases."

The most frequent cause of toothache is caries or decay. Where this is superficial, or not so deep as to involve the pulp of the tooth, the pain is of a dull boring nature. Sweets, acids, hot or cold fluid, may excite an attack, and though it does not long continue yet it recurs from time to time. In these cases temporary relief will be obtained by placing some carbonate of soda in the cavity of decay, or cotton saturated with either oil of cloves, permanganate of potash (Condy's Fluid), carbolic acid, or a mixture of equal parts of chloral and camphor, and applied to the decayed surface will afford relief. In using these local applications care should be taken to protect the mucous membrane of the mouth from being touched, for some of the substances so used are destructive.

When the pulp of the tooth has become the

seat of inflammation the pain produced is of a throbbing, darting, acute kind. It comes on suddenly and, after lasting some minutes, or even three or four hours, as suddenly passes off. It frequently comes on a little while after getting into bed, and may recur after an uncertain interval of relief. Benefit may be obtained from the local application of cotton saturated with either carbolic acid, oil of cloves, camphor and choral in equal parts, laudanum, aconite, chloroform, &c. But it must be remembered that if ease be gained, it is almost certain to be only temporary; and if the aid of the Dentist is not sought the tooth will be a cause of more suffering, and eventually be lost.

Sometimes pain in a tooth is caused by the gum and socket receding and exposing the neck of the tooth to irritating influences. At this part of a tooth the enamel terminates and the substance covering the root—the cementum—is so thin as to form a very imperfect protection to the sensitive dentine. There is no cavity, no decay, yet the tooth gives rise to pain when sweets, acids, or cold fluids are taken, or when the tooth-brush or other hard

substance comes in contact with this portion that the gum has receded from. In these cases comfort will be derived from the local use of tannin and eau de Cologne.

The periosteum, or membrane connecting the teeth with the bone of the jaw, often becomes the seat of disease and causes tooth-ache. It may become inflamed from mechanical injury, from disease of the tooth-pulp, cold, certain medicines, or other constitutional conditions, as rheumatism, &c. The tooth or teeth affected are tender to the touch, they are slightly raised in their sockets and meet their opponents with undue prominence. There is a tendency to bite upon them, and this gives a few moments relief, but eventually this rather increases than alleviates the pain. Hot poppy head fomentations, or painting the gum with a mixture of tincture of aconite and iodine may be useful; but the causes of this periostitis are so varied, and the results to be desired, as dispersing the inflammation or favouring suppuration, require such different lines of treatment that a rational and general remedy cannot be advocated in these pages. An intelligent practitioner should be consulted, who

would have an opportunity of studying the case and advising or treating according to his judgment.

It will be understood from the foregoing paragraphs that most cases of toothache are curable, and that by conservative treatment the teeth so affected may be rendered comfortable and useful for years afterwards. Of course there are many instances in which the extraction of the offending member is the only remedy; but it can be truthfully said that a very large number of teeth are sacrificed by the forceps that could, with a little treatment and patience, be restored to a condition of comfort and usefulness.

NEURALGIA

That condition known as pain in the nerves or *Neuralgia*, is one of the nervous disorders that disease of the teeth may give rise to. Neuralgia differs from toothache in this—namely, that the pain of toothache is limited to the tooth which is the cause of trouble, whereas in neuralgia the pain is either diffused over a larger area than the offending tooth, or it is transmitted to some more or less distant part, as the eye, the ear, the shoulder, &c. By referring to fig. 28 some idea can be formed of the connections of the nerves supplying the teeth with those distributed to more or less distant parts.

If the nerve cords be thought of as telegraph wires, it will readily be understood how a current or nervous disturbance set up at a tooth can be transmitted through the various connections to distant parts, and there be discharged producing the phenomenon pain. There is no limit to the distance within the body this nervous disturbance may be transmitted to. Arising in a tooth it may be

referred far beyond the eye or the face, even to the hands or the toes.

FIG. 28.

Fig. 28 diagramatically represents the nerves supplying the teeth, part of the face, and front of the head. The branch supplying the twigs to the lower teeth, and also that similarly connected with the upper teeth, are two of three main branches given off from the trunk of the largest nerve in the head.

But pain or neuralgia is not the only form of irregular nerve action arising from the teeth. Muscular spasm, also, is often attributable to some dental cause, and this may be exhibited by closure of the jaws, twitching or partial closing of an eye, diarrhœa, &c. Eruptions upon the face and head are likewise a manifestation of nervous disturbance, sometimes due to the condition of the teeth. Epilepsy, too, has, in several cases recorded, been attributed to diseased teeth. The writer has had one very marked case of this nature. The onset of the epilepsy dated from the time when decay of many of the patient's teeth had so far advanced as to produce inflammation and suppuration of the pulps. The fits had been occurring for two years, with at times two and three fits in one day, when the patient happened to come under notice. The suppurating tooth pulps were treated, the roots and teeth were filled, all causes of irritation (so far as the teeth were concerned) were removed, and the mouth restored to a healthy condition. As this treatment proceeded, the fits occurred less frequently, and eventually, within three months

of first seeing the case, one month elapsed without a recurrence of the attacks. After that the (hospital) patient was lost sight of.

There are several conditions of the teeth that may give rise to nervous disorder. Decay leading to disease of the tooth-pulp is the most common cause; and this the careful Dentist will, in most instances, readily make out. But there are other states of the teeth where decay does not necessarily exist, in which it is often difficult to ascertain which is the tooth at fault. The tooth-pulp is

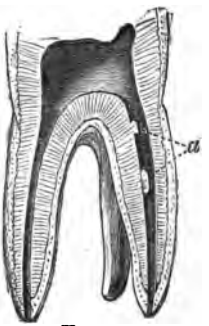


FIG. 29.

Fig. 29 shows at *a* two large nodules of calcified substance in the pulp and attached to the wall of the pulp cavity.

occasionally the seat of calcification, that is, bony nodules form in it, and these hard

masses irritate the fine nerve filaments. Irritation being thus produced may give rise to distinct and local toothache; or some of those nervous disorders already alluded to may ensue, and the practitioner be perplexed to find out the diseased tooth. Frequently in these cases the patient cannot refer the pain to any particular tooth, and often does not think a tooth to be the cause of suffering.

The illustrations, Figs. 29 and 30, show the condition under consideration.

FIG. 30.

Fig. 30 represents a microscopic drawing of tooth-pulp which is the seat of diffuse calcification. The islands of deposited lime are seen to be scattered throughout the pulp substance.

The tooth from which was taken the preparation illustrated by figure 30, was extracted

from a patient who had suffered acutely from neuralgia in the region of the mouth and the ear of the right side. There was a very slight amount of decay of the tooth, not at all likely to produce the pain that was endured—the actual cause of the pain being the hidden disease of the pulp, as revealed by the microscope.

Another disease of the teeth, of which frequently there are little external indications, which gives rise to nervous disorder is that characterised by an excessive bulbous enlargement of the root or roots of a tooth, and which is known by the term *exostosis*. This condition, shown in figures 31 and 32, like

FIG. 31.

FIG. 32.

Figs. 31 and 32 represent an enlargement or *exostosis* of the roots of the teeth.

that illustrated by figures 29 and 30, may or may not be associated with caries or decay of the tooth affected.

The brief description here given of some of the serious and more or less remote effects of diseases of the teeth will accomplish the purpose of the writer if it serves to impress upon the reader something of the importance of proper attention being paid to the teeth. Furthermore, the last three chapters indicate very forcibly the mutual relation and sympathy that exist between the various structures and functions of the very complex organism —the human body. And the inference to be drawn from this chapter cannot be misunderstood, namely, that in many forms of nervous disorder the teeth should be examined by a competent practitioner, and the mouth placed in good condition.

ERUPTION OF THE TEETH.

The first sign of the formation of the temporary or milk teeth is observable at seven and-a-half months before birth, and they begin to appear in the mouth, cutting through the gum, at about the sixth month after birth. The several teeth, usually appearing in pairs, make their way through the gum at varying intervals until about the second year, when the second molars are erupted, making in all twenty teeth—ten above and ten below. At about four and a-half years these teeth have become fully developed.

The permanent teeth present the first indication of their development at about five months before birth, but it is not until the sixth year that the first member of the series appears in the mouth. This is the first permanent molar, commonly called the six-year old molar. Counting from the median line of the jaw, at the age of six or six and a-half years, the first permanent molar is the sixth tooth. Parents very frequently think this tooth a temporary one, and, being in the

majority of cases affected with decay at an early age, it is often neglected until the ravages of caries have reduced the tooth to a very painful and irreparable condition. The next teeth to come through the gum are the incisor or front teeth, the others following in definite order.

The following tables indicate the ages at which the several members of the temporary and of the permanent series are erupted :—

TEMPORARY TEETH (10 IN EACH JAW).

6th to	7th month	... central incisors.
7th to	10th „	... lateral incisors.
12th to	14th „	... first molars.
14th to	20th „	... canines (or eye-teeth).
18th to	36th „	... second molars.

PERMANENT TEETH (16 IN EACH JAW).

6th to	7th year	... first molars.
	7th „	... central incisors.
	8th „	... lateral incisors.
	9th „	... first bicuspids.
	10th „	... second bicuspids.
11th to	12th „	... canines.
12th to	14th „	... second molars.
17th to	25th „	... third molars (or wisdom teeth).

Though the eruption of the teeth is a perfectly natural process, yet, with infants, it is nearly always attended with some degree of suffering. It is stated at page 9 that, in infants, the healthy balance for the rapidly growing nervous system is easily disturbed, and because of this the time of teething is a very critical period to the child. The ordinary symptoms of teething in an infant are drivelling of saliva, a thickening of the gum in the region of the approaching tooth, and some restlessness. Beyond these conditions the mouth may be hot, the gums tumid, tense and shining, a profuse flow of saliva, ulceration of the mouth, eruptions upon the head and face, diarrhœa, general fever, convulsions, &c. But it must be remembered that all the diseases coming on during the process of teething are not necessarily dependent upon the eruption of the teeth. There is a special liability of children to illness at this time, and dentition is only one of many causes that are liable to produce the serious disturbances that are too common at this period. The importance of proper feeding cannot be too much observed in this connection, mention of which is made on pages 9, 13, 14, &c.

As there are so many causes which may produce those sometimes alarming conditions of infants, it would be out of place to give in these pages any hints as to their treatment. Indeed such practice distinctly comes within the province of the General Practitioner, and he should be consulted as to the appropriate treatment—treatment of causes, often recondite, and not the emperical treatment of symptoms and effects.

ARTIFICIAL TEETH.

The loss of teeth is a fatality from which few persons of the present generation are exempt. Though there are now better and more successful methods of treating diseases of the teeth than were known even twenty years ago, yet instances come within the experience of every Dental practitioner, where, notwithstanding good and conscientious operations, and hygienic care on the part of the patient, the teeth of such individuals seem doomed to be lost, from one disease or another.

When the natural teeth have been lost the deficiency should be supplied by artificial substitutes. Suppose, for example, a molar tooth is lost from the lower jaw, the upper tooth which antagonised with it, if it does not meet any other lower tooth, will grow down, and become longer than its neighbours. This apparent lengthening is actually due to the tooth being forced out of its socket, and as the process proceeds, the tooth becomes more and more loose, and

in the course of a few years it is lost also. This is a consequence of the tooth having lost its opponent, and, having little or no work to do, it becomes the seat of those changes which end in its elimination. But, if shortly after the lower tooth was lost, an artificial substitute was adopted, to meet the upper one and keep it in use, the loosening, and ultimate loss of the second tooth, would be averted; while at the same time its service as a masticator would be maintained.

When several grinding teeth have been lost, the food is imperfectly masticated and mixed with the saliva. In this condition the food is bolted, and indigestion of a very chronic and intractable form frequently arises. In such cases the front teeth, which are not adapted for grinding, are made to do masticatory work, and they often get worn down so very short, or so very thin (according to the articulation of the upper and lower teeth), that their pulps become exposed, and then these teeth also are doomed to destruction. Here again, the timely insertion of artificial grinding teeth would have spared the ills of chronic indigestion, and saved the front teeth.

The benefits to be derived from well-fitting artificial dentures are beyond question. Speech, mastication, digestion, nutrition, personal appearance, and comfort, are in the majority of instances considerably improved. But nothing can be more intolerable than a badly-fitting, wrongly-constructed denture. Artificial teeth are good and desirable substitutes, but, be they ever so well made, they cannot equal the natural organs.

There are many substances used as bases for artificial dentures, each material having its own advantages. And as each case must be constructed according to the special circumstances attending it, no definite, general statement can be made as to which base is the best.

Artificial dentures should be kept clean, and with partial cases especial care should be taken to thoroughly cleanse those parts that fit round and come in contact with the natural teeth. With daily attention to these particular points, injurious effects upon the natural teeth are practically nil.

GENERAL INSTRUCTIONS.

That the poor patients attending the National Dental Hospital, London, should have given to them some general and useful information regarding the care of the teeth the Medical Committee of that Institution prepared and issued, in the form of a card, the following directions :—

I.—The teeth should be cleaned at least once a day, the best time being at night—last thing. For this purpose, use a soft tooth-brush, on which take a little soap, and then some precipitated chalk, brushing up, down, and across. There is rarely any objection to the friction causing the gums to bleed slightly.

II.—Avoid all rough usage of the teeth, such as cracking nuts, biting thread, &c., as by so doing even good sound teeth may be injured.

III.—When decay is first observed, advice should at once be sought. It is the "stopping" in a small hole that is of the greatest service; though not unfrequently a large filling preserves the tooth for years.

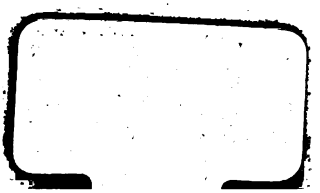
IV.—It is of the greatest importance that children from four years of age and upwards should have their teeth frequently examined

by a Dental Surgeon, to see that the first set, particularly the back teeth, are not decaying too early; and to have the opportunity of timely treatment for the regulation and preservation of the second set.

V.—Children should be taught to *rinse* the mouth night and morning, and to begin the use of the tooth-brush early.

VI.—With regard to the food of children, to those who are old enough, "whole-meal" bread, porridge, and milk should be given. This is a much more wholesome and substantial food than white bread.

VII.—If the foregoing instructions were carried out, comparatively few teeth would have to be extracted.

VIII.—Those who do not seek nor receive hospital aid, are recommended to consult qualified practitioners, and not persons who advertise by show-cases, puffing advertisements, &c.

Some thousands of the cards have been distributed by this Hospital; and similar institutions, appreciating the value, and the good results to be obtained from those instructions, have also been induced to issue a like code of directions. For the same reasons they have been reproduced here.